Nā I‘a Kapu: A Pre-Visit Online Lesson for Hanauma Bay

Anne Nanea Rosa
University of Hawai‘i at Mānoa
Department of Educational Technology
1776 University Avenue, Wist Hall, Room 232
Honolulu, Hawaii, USA
annerosa@hawaii.edu

Abstract: Natural areas like Hanauma Bay provide a captivating setting for place-based and culture-based science lessons. When students visit Hanauma Bay, they have limited time to learn about the bay during their field visit. To enhance the field experiences of students, an online pre-fieldtrip lesson was developed for teachers to use to prepare their 3rd-5th grade students for a Hanauma Bay field visit. The lesson was designed to teach concepts of Hawaiian kapu (prohibitions or laws) as they relate to conservation and to Hawaiian reef fish biology. The lesson was developed using learning standards for the relevant grade levels and the ADDIE method of instructional design. 3rd-5th grade teachers and informal educators who have used Hanauma Bay as an educational site evaluated the instructional design via an anonymous online survey. Responses were received from 12 participants. Descriptive statistics were used to examine the responses and themes were derived from open-ended comments. Results indicated teachers perceived the lesson was engaging, aligned with class learning objectives, grade level appropriate, and would help to prepare students for a visit to Hanauma Bay. The teachers particularly valued the integration of science and Hawaiian culture and the connections made between kapu and fish life cycles.

Introduction

Hanauma Bay is a Marine Life Conservation District that was established by the State of Hawai‘i in 1967 to protect the marine life in the bay. The Hanauma Bay Education Program is a University of Hawai’i Sea Grant Program that promotes stewardship of Hanauma Bay through environmental education. When school groups visit Hanauma Bay, they participate in educational sessions and field lessons conducted by the Hanauma Bay Education Program. Due to the limited amount of time classes typically spend visiting Hanauma Bay, students can benefit from lessons that prepare them for their field visit. There is a need to provide learning content that teachers can use to integrate Hawaiian marine life conservation practices and science lessons as well as prepare students for a visit to Hanauma Bay. A pre-visit online lesson was designed to address these needs.

Background

Historically, Hawaii's near shore fishery was managed under the kapu system (traditional Hawaiian law). Hawaii's near shore fishery was once able to sustainably feed a large population. However, in modern times the fishery has been declining for decades (Jokiel, Rodgers, Walsh, Polhemus & Wilhelm, 2011). In order to address fisheries declines; there have been movements in multiple communities in Hawai'i toward place-based and community-based co-management of fisheries (Tissot, Walsh & Hixon, 2009). One of the challenges that Tissot, Walsh & Hixon list for scaling up community based management is "the limited extent of community involvement." Educating the youth is an important way to engage the community in stewardship of ocean resources.

As the next generation of citizens, Hawaii's youth can learn valuable lessons from traditional Hawaiian marine life conservation practices. These traditional practices can be taught in the present day context of the Hanauma Bay Marine Life Conservation District.

Educators participating in this study evaluated an online pre-visit lesson for Hanauma Bay based on how they thought it would contribute to their students' learning and preparation for a visit to Hanauma Bay. The purpose of this instructional design project was to develop and evaluate a web-based instructional module that relates traditional Hawaiian kapu to the conservation of Hawaiian reef fish in order to prepare 3rd-5th grade students on O'ahu for a field visit to Hanauma Bay.

Literature Review

Virtual Field Trip

As information and communication technology grows, virtual field trips can provide educational value for supporting science education fieldwork and enriching the teaching experience (Puhek, Perse, Perse, & Sorgo, 2013). Spicer (2001) conducted a study using a computer based virtual tide pool environment to explore and learn about tide pool biology. Students later had a field study in a real tide pool environment. Students said they enjoyed and learned from the virtual field trip. They said that it prepared them well for the real field trip, but they didn't think that the virtual field trip should replace the real field experience. The results of this study indicate value in a hybrid approach that combines a virtual field trip with a field study in biology in order to enhance the overall learning experience. When students come to Hanauma Bay with prior knowledge of Hawaiian marine life, cultural practices and conservation issues, they will be better prepared to learn during the limited time they have for a field visit.

Cultural Traditions & Values

The online lesson for Hanauma Bay relates traditional Hawaiian methods of marine resource management and the cultural value of kapu to marine life conservation in Hawai'i today. Hawaiian traditional ecological knowledge has much to offer modern environmental restoration efforts including a Hawaiian environmental ethic and a concern for the future of resources (Gon III, 2003). Traditional ecological knowledge and practices bring a key social component to environmental education. "An essential

component for traditional knowledge and practice for ecologically sustainable outcomes is a worldview that provides appropriate environmental ethics" (Berkes, Colding & Folke, 2000). When educating with the goal of achieving environmental sustainability, traditional ecological knowledge contributes cultural values to environmental science education (Kimmerer, 2012).

Design

The *Nā I'a Kapu – Pre-Visit Online Lesson for Hanauma Bay* instructional design project introduced learners to marine life conservation, Hawaiian fishing kapu and fish life cycles. The module emphasized the connection between conservation and Hawaiian fishing kapu and how knowledge of fish life cycles is necessary for practicing fish conservation. At the end of the module participants were expected be able to; give examples of life cycles of Hawaiian reef fish, to define fish conservation, define and give examples of Hawaiian fishing kapu, explain the connection between fish life cycles and Hawaiian kapu, explain how knowlege of fish life cycles is necessary to practicing fish conservation and explain the connection between Hawaiian kapu and conservation.

The module was written at a reading level accessible to 3rd-5th grade students. The embedded pictures, animations and videos were designed to illustrate the learning concepts and appeal to students. Instructional applications of visual design for Motivation, Attention-gaining and Presentation were used in designing the graphics in the module (Reiber, 2000). At the beginning of each page of the lesson, there is a cartoon character of a fish that prompts students for what they will be learning in that section. Visuals are used to present the fish life cycle and introduce learners to the environment and types of fish they may see at Hanauma Bay. The module includes interactive quiz questions that provide feedback to the learner.

The website for this instructional module was built using the online website creation tool Wix. The website includes short embedded videos to illustrate and explain key concepts in the module. The videos were embedded into the website via the online streaming video sites YouTube and Vimeo. The module is available online at http://anneros7.wix.com/kapu.

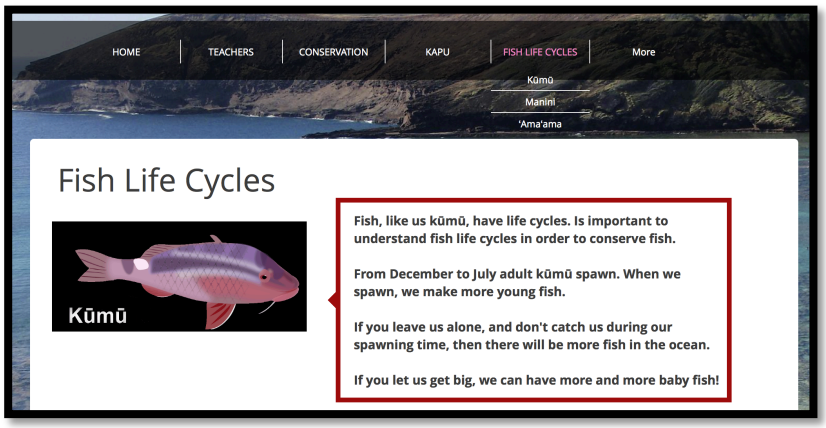


Figure 1. Screenshot of Nā I'a Kapu online module.

Methods

Participants
Subject matter experts had input on the instructional design prototype in a first round of review. These subject matter experts included Hawai‘i based environmental educators and Hawaiian lawai‘a (fishermen). Environmental educators are experienced at teaching youth about marine conservation and are motivated to develop learning resources that promote marine conservation. Hawaiian lawai‘a are knowledgeable about fishing traditions including kapu. The instructional design was evaluated in a second round of testing by educators who use Hanauma regularly. These educators were candidates to use the online module with their students before coming to Hanauma. These educators were motivated to meet their 3rd-5th grade student learning needs with properly evaluated resources. This study was conducted after receiving approval from the University of Hawai‘i Institutional Review Board. All participants were volunteers and data were collected via an anonymous online survey.

Data Collection
This study was implemented on site at Hanauma Bay as well as online using the web-based module and anonymous online evaluation surveys. Subject matter experts and educators were recruited as volunteers via personal contacts. Subject matter experts were asked to review the online module and provide verbal feedback. Based on this feedback the module was finalized for testing with educators. In the second round of testing, educators were asked to review the module and respond to an anonymous online survey (see appendix). The online survey included demographic questions, open-ended questions as well as Likert-type questions that measured attitudes along a five-point scale (Strongly Agree, Agree, Neutral, Disagree, Strongly Disagree). Educators were asked to evaluate the module based on how it meets learning standards and goals for their classes and how well they think the module will contribute to student motivation to learn.

Data Analysis
In total, 12 participants completed the online survey. Survey items were grouped into categories for analysis. Descriptive statistics were used to examine the survey responses and themes were derived from open-ended comments.

Results

Demographics
When responding to demographic questions, participants were able to indicate all responses that applied to them, so the total responses listed in some cases add up to more than 12. Participants responded that they taught at multiple grade levels. Participants taught Grade 5 (4), Grade 4 (4) and Grade 3 (2). Of the 12 participants, 4 individuals indicated that they specifically taught at the targeted 3rd-5th Grade levels. In addition to teaching grade levels at the grade levels targeted for this study, participants also taught in K-2nd, High School, College, Community and Informal settings. Participants spanned the following subject areas; Science (1), Marine Science (1), Social Studies (4), Hawaiian Studies (3), Language (2), ‘Ōlelo Hawai‘i or Hawaiian Language (1) and Math (2).

Participants taught at Public Schools (7), Independent Schools (2) and in Natural Settings (2). Although most participants held Master's Degrees (9), participants' education ranged from a High School Diploma (1) to an Undergraduate Degree (1) to a Doctorate Degree (1).

Participant Survey Responses

Based on a five-point Likert scale, all of the responses listed for the following questions in Table 1 were either a 5 (Strongly Agree) or a 4 (Agree) or a or 3 (Neutral). None of the participants responded 2 (Disagree) or 1 (Strongly Disagree).

Table 1. Number of participant survey responses for each category on a Likert scale.

Categories	Statements	Strongly Agree (5)	Agree (4)	Neutral (3)	Mean
Ease of Use	The web-based lesson is easy to use	10	2	0	4.8
Ease of Use	I was able to access all of the web-based content of this lesson	11	1	0	4.9
Content	The content of this lesson is appropriate for the 3rd-5th grade level	10	2	0	4.8
Content	The content of the lesson is aligned with the learning objectives of the lesson	11	1	0	4.9
Content	This lesson addresses learning objectives I have for my classes	6	5	1	4.2
Pedagogy	This lesson effectively integrates science concepts and cultural concepts	10	2	0	4.8
Pedagogy	Integrating science and culture is important to me	11	1	0	4.9
Pedagogy	The technology used to deliver this lesson makes it engaging	11	1	0	4.9
Usefulness	This lesson would help me to prepare students for a visit to Hanauma Bay	8	4	0	4.7
Usefulness	This lesson would help me engage my students in learning	9	3	0	4.8
Usefulness	I would use this lesson even if I wasn't planning on bringing my class to visit Hanauma Bay	9	2	1	4.4
Usefulness	I would recommend this lesson to other educators	10	2	0	4.8

Participants found the lesson easy to use and were able to access the all of the web-based content of this lesson. One participant liked the ease of navigation of the online module. One participant said that the narration of the video was done at a proper speed.

Participants found the content appropriate for the 3rd-5th Grade levels and aligned with the learning objectives of the lesson. The majority of participants found that the content of the lesson addressed learning objectives they had for their classes. Participants said the lesson aligned with the following learning objectives they have for their classes; conservation, cultural anthropology, history, fish etiquette, place-based science and life science benchmarks for 5th grade. One participant said the module was "*Really straightforward, easy to navigate and (the) educational information (was) to the point."* Another participant thought that the module had simple sentences that were easy to read. One participant said that they liked the feedback on quiz answers that reiterated and extended understanding.

Participants said that integrating science and culture was important to them and that the lesson effectively integrated science concepts and cultural concepts. One participant stated that a reason why they would use the lesson is that it is an "*Excellent method of tying together traditional and cultural knowledge with the kapu of today."*

Participants thought the lesson itself and the technology used to deliver the lesson would be engaging for their students. They thought the lesson would help to prepare their students for a visit to Hanauma Bay. One participant mentioned that the module would be good for preparing the teacher. The majority of participants said they would still use the lesson even if they weren't planning a visit to Hanauma Bay. Participants said that they would recommend this lesson to other educators.

The reasons that participants said they would use this lesson were to integrate science, culture and conservation, to apply traditional knowledge to the present day, to relate kapu to conservation, to integrate technology and education and to prepare for a Hanauma Bay field visit. For example, one participant stated that they would use the lesson because of its *"Integration of technology and education. Integration of science, culture, and conservation."*

The reasons participants said that they would bring their class to visit Hanauma Bay included exploring and experiencing Hanauma Bay, taking students somewhere they may not go on their own, learning about the marine ecosystem and how people can work together to protect it and for hands on learning.

The areas for improvement that were identified by the participants included; adding more audio for students with limited reading proficiency and modifying the interactive quizzes to make the majority of questions multiple choice to reduce typing time and streamline the quiz feedback mechanism. One participant suggested more historic Hawaiian newspaper articles and ʻŌlelo Noʻeau (traditional wise sayings).

Discussion

The results of this study show that educators perceived the module as easy to use, grade level appropriate and useful for preparing students to visit Hanauma Bay. In order for teachers to use the module with their students it has to meet the learning objectives that they are trying to achieve. The results showed that this module was aligned with multiple learning objectives that the participating educators had for their students. When designing further pre-visit lessons for educators to use before coming on a field visit it is important to design them to be easy to use and useful to the educators who will be implementing them.

Place-based learning is by nature integrative. When designing a lesson for a place like Hanauma Bay, there are opportunities to make connections between science and culture. One of the aspects of this module that educators valued was the integration of science and culture. The positive response to the integration of science and Hawaiian culture in this module is significant to Hawai‘i environmental educators designing lessons in the future.

The suggestions for improvement that came through this formative evaluation will be used to create a better educational tool for teachers to use to prepare their 3rd-5th grade students for a field visit to Hanauma. One of the suggestions for improvement of the module was to add more audio to the text on the website. When designing an online lesson for students of varying reading abilities the combination of text and audio can make the content more accessible to students.

Conclusion

Using a multimedia online module to prepare students to visit Hanauma Bay can be an effective way to enhance learning and build enthusiasm for a field visit to Hanauma. Web-based teaching tools have the potential to enhance the learning experience that the Hanauma Bay Education Program provides by expanding the reach of the education program to Hawaii’s youth.

Using technology to perpetuate traditional knowledge allows today’s students an additional avenue to connect with the information of their kupuna (elders). This lesson is an example of how technology can be used to aid in learning and integrating cultural content and science content. Further research is needed to explore how students’ interests and connections to Hawaiian culture and Hawai’i’s marine environment can motivate them to engage in online lessons that integrate science and culture.

References

Berkes, F., Colding, J., & Folke, C. (2000). Rediscovery of traditional ecological knowledge as adaptive management. *Ecological Applications*, *10*(5), 1251–1262.

Gon III, S. M. (2003). Application of traditional ecological knowledge and practices of indigenous Hawaiians to the revegetation of Kahoʻolawe. *Ethnobotany Research & Applications, 1*, 5-20. Retrieved from http://scholarspace.manoa.hawaii.edu/handle/10125/125

Jokiel, P., Rodgers, K., Walsh, W., Polhemus, D. & Wilhelm, T. (2011). Marine resource management in the Hawaiian archipelago: The traditional Hawaiian system in relation to the western approach. *Journal of Marine Biology*, *2011*, 1-16. doi:10.1155/2011/151682

Kimmerer, R. (2012). Searching for synergy: integrating traditional and scientific ecological knowledge in environmental science education. *Journal of Environmental Studies and Sciences*, *2*(4), 317–323. doi:10.1007/s13412-012-0091-y

Spicer, J. (2001). Student perceptions of a virtual field trip to replace a real field trip. *Journal Of Computer Assisted Learning*, *17*(4), 345-354.

Tissot, B., Walsh, W., & Hixon, M. (2009). Hawaiian islands marine ecosystem case study: ecosystem- and community-based management in Hawaii. *Coastal Management*, *37*(3-4), 255–273. doi:10.1080/08920750902851096

Puhek, M., Perse, M., Perse, T. V., & Sorgo, A. (2013). Perceived usability of information and communication technology and acceptance of virtual field trips by lower secondary students, undergraduate students and in-service teachers. *Journal of Baltic Science Education*, *12*(6), 803–812.

Rieber, L. P. (2000). *Computers, graphics & learning.* Georgia: Lloyd P. Rieber.

Appendix

Instructional Design

Lesson Objective:

Elementary school teachers (Grades 3-5) planning a visit to Hanauma Bay will be able to explain how Hawaiian fishing kapu are designed to contribute to fish conservation and how an understanding of fish life cycles is necessary when practicing fish conservation.

Key Concepts:

- Hawaiians used the kapu system to conserve fish by preventing overfishing.
- In order to prevent overfishing today, we can limit the fish we take and time our fishing to the life cycles of fish.

Instructional Hierarchy:

- Skill: Explain how knowledge of the life cycles of fish is necessary to practicing fish conservation.
    - Subordinate Skill: Define fish conservation.
    - Subordinate Skill: Give examples of life cycles of Hawaiian reef fish.
- Skill: Explain the connection between Hawaiian kapu and conservation
    - Subordinate Skill: Define traditional Hawaiian kapu.
    - Subordinate Skill: Give examples of traditional Hawaiian fishing kapu.
    - Subordinate Skill: Explain the connection between fish life cycles and Hawaiian kapu

HCPS III Learning Standards:

- Social Studies - Grade 4 (SS.4.4.1) Evaluate the kapu system in the context of the time.
- Social Studies - Grade 4 (SS.4.5.1) Describe the roles, rights, and responsibilities of each class in pre-contact Hawai‘i.
- Science - Plants and Animals in Hawai‘i (SC.PAH.3.6) Describe how conservation efforts have impacted organisms in Hawai‘i. Explain how human actions (e.g., conservation, introduction of nonindigenous species, destruction and fragmentation of native habitat, hunting, over harvesting, poor land use practices, stream diversion) have impacted organisms in Hawai‘i since the first Polynesians.
- Environmental Science (SC.ENV.5.3) Explain how population growth and natural resource consumption affect global sustainability.

Online Survey

Survey - Hanauma Lesson Survey

My name is Anne Rosa, and I am a graduate student at the University of Hawai'i (UH). A requirement of my Master's degree program is to conduct a research project. The purpose of my project is to evaluate a web-based instructional module that relates traditional Hawaiian kapu (prohibitions or laws) to the conservation of Hawaiian reef fish in order to prepare 3rd-5th grade students on Oahu for a field visit to Hanauma Bay.

Participation in this study will involve the completion of an anonymous on-line (Internet) survey. I am asking you to participate in this project because you are an elementary school teacher on the island of O'ahu. The results of this project may contribute to creating a better educational tool for teachers to use to prepare their 3rd-5th grade students for a field visit to Hanauma Bay.

Completion of the survey will take approximately 20 minutes.

1. **For each of the following statements, indicate whether you strongly agree, agree, disagree or strongly disagree**

Mark only one oval per row.

	Strongly Agree	Agree	Disagree	Strongly Disagree
The content of this lesson is appropriate for the 3rd-5th grade level	◯	◯	◯	◯
The content of the lesson is aligned with the learning objectives of the lesson	◯	◯	◯	◯
This lesson addresses learning objectives I have for my classes	◯	◯	◯	◯
This lesson effectively integrates science concepts and cultural concepts	◯	◯	◯	◯
Integrating science and culture is important to me	◯	◯	◯	◯
I was able to access all of the web-based content of this lesson	◯	◯	◯	◯
The web-based lesson is easy to use	◯	◯	◯	◯
The technology used to deliver this lesson makes it engaging	◯	◯	◯	◯
This lesson would help me engage my students in learning	◯	◯	◯	◯
This lesson would help me to prepare students for a visit to Hanauma Bay	◯	◯	◯	◯
I would use this lesson even if I wasn't planning on bringing my class to visit Hanauma Bay	◯	◯	◯	◯
I would recommend this lesson to other educators	◯	◯	◯	◯

2. **The parts of this lesson that I found the most useful were**
   Check all that apply
   Check all that apply.

   - [ ] Fish Life Cycles
   - [ ] Hawaiian Kapu
   - [ ] Fish Conservation
   - [ ] Connecting Kapu & Fish Life Cycles
   - [ ] Other: _____

3. **This lesson is aligned with the following learning objectives that I have for my class**

   _____

   _____

   _____

   _____

   _____

4. **I would like to suggest the following improvements to this lesson**

   _____

   _____

   _____

   _____

   _____

5. **My reasons for using this lesson would be OR My reasons for not using this lesson would be**

   _____

   _____

   _____

   _____

   _____

6. **The reasons I would bring my class to Hanauma Bay are**

_____

_____

_____

_____

_____

7. **I teach the following grade levels**
   Check all that apply
   Check all that apply.

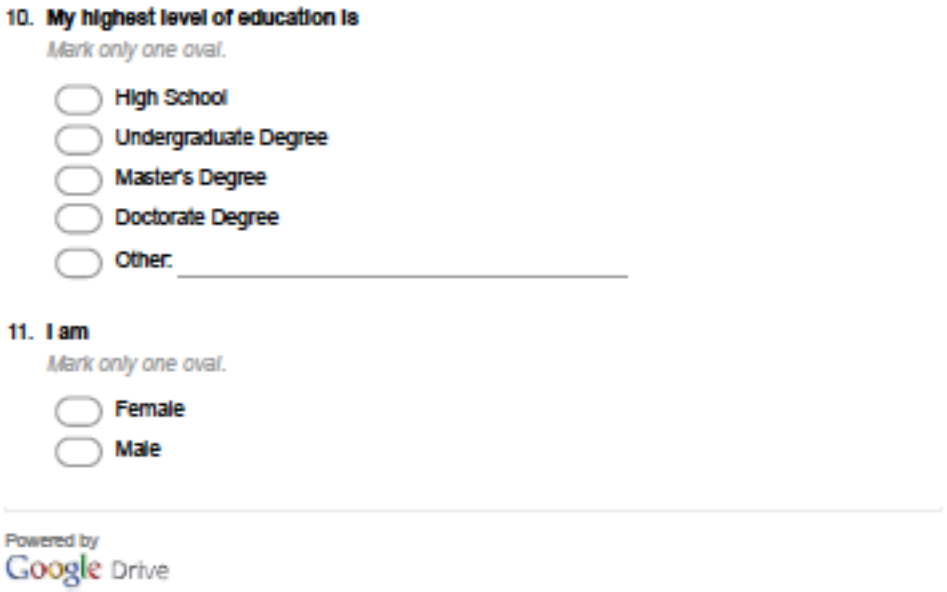
   - [ ] Grade 3
   - [ ] Grade 4
   - [ ] Grade 5
   - [ ] Other: _____

8. **I teach the following subjects**
   Check all that apply
   Check all that apply.

   - [ ] Science
   - [ ] Math
   - [ ] Social Studies
   - [ ] Hawaiian Studies
   - [ ] Other: _____

9. **I teach in a**
   Mark only one oval.

   - ◯ Public School
   - ◯ Independent School
   - ◯ Other: _____


10. My highest level of education is

Mark only one oval.

- High School
- Undergraduate Degree
- Master's Degree
- Doctorate Degree
- Other: _____

11. I am

Mark only one oval.

- Female
- Male

Powered by Google Drive

Participants' responses to open-ended survey questions

Participants' responses to the statement: My reasons for using this lesson would be OR My reasons for not using this lesson would be

> *I would use this lesson as a follow-up activity in my classroom in preparation for a going-out trip to Hanauma Bay (Montessori).*
>
> *Integration of technology and education. Integration of science, culture, and conservation.*
>
> *Excellent method of tying together traditional and cultural knowledge with the kapu of today.*
>
> *Teaching the kapu system and how it relates to conservation*
>
> *Fits right in with our conservation lessons here at the Bay*
>
> *To prepare them for their Hanauma Bay field trip*
>
> *Many reasons for using this lesson! I love "We can apply lessons from the past to mālama i ke kai today." Loved the 'Anae Holo story!*

Participants' responses to the statement: The reasons I would bring my class to Hanauma Bay are

> *A learning objective of my classroom is for the children to go out into their world to explore. Hanauma Bay is a perfect local resource for this objective.*

Our students live in Central Oahu and rarely go to the east side of the island. It would give them an opportunity to experience a place on their island.

For hands on learning

Many students may never visit the Bay on their own. When you go with a school group, you are able to learn about the Bay and its importance in our Hawaiian ecosystem. Plus, the children love to go to the beach and see the sea life.

It's a magnificent marine protected area; it shows how society can work together to make good things happen.

Participants' responses to the statement: I would like to suggest the following improvements to this lesson

It's good for preparing the teacher for her class. It's not clear if students in the lower grades would get as much out of it depending on their reading and comprehension skills.

Maybe more ʻōlelo noʻeau, newspaper articles?

Really straightforward, easy to navigate and educational information to the point.

proof read all text (clif), acknowledge all correct answers, allow for unmarked text (kumu, kūmū), offer correct answers, whether incorrect or blank is left.

Audio for students with limited English proficiency.
Less typing for the quiz and more multiple choice since students are not fast typers.
Can some of what is being taught on this website be incorporated into the actual field trip at Hanauma Bay? Perhaps seeing the actual fish and their different stages?

--good, simple sentences to read
--audio with video is proper speed, not too-fast-talk
--I like the way the feedback on both correct and incorrect quiz answers reiterates and extends understanding.
--spotted what I think are 2 typo errors: (1) "clif mullet" should be cliff mullet? (2) check this: "Many ʻamaʻama are able to reproduce by they time the reach 11 inches long."

I think the quizzes at the bottom of each page should all be multiple choice, rather than fill-in answers.